

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
13 September 2007 (13.09.2007)

PCT

(10) International Publication Number
WO 2007/103965 A1

(51) International Patent Classification:
H01G 4/35 (2006.01)

(21) International Application Number:
PCT/US2007/063463

(22) International Filing Date: 7 March 2006 (07.03.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/779,455 7 March 2006 (07.03.2006) US

(71) Applicant (for all designated States except US): **X2Y ATTENUATORS, LLC** [US/US]; 2730 B West 21st Street, Erie, PA 16506-2972 (US).

(72) Inventor: and

(75) Inventor/Applicant (for US only): **ANTHONY, David, J.** [US/US]; 3646 Fountain Way, Erie, PA 16506 (US).

(74) Agent: **NEIFELD, Richard, A.**; Neifeld IP Law, P.C., 4813-B Eisenhower Avenue, Alexandria, VA 22304 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

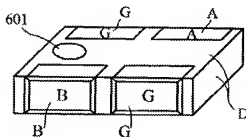
Published:

— with international search report

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: **ENERGY CONDITIONER STRUCTURES**



(57) Abstract: Disclosed are energy conditioner structures, method of making and using them wherein the structure comprises a sequence of conductive layers including a first A layer, a G layer, and a first B layer, wherein said first A layer, said G layer, and said first B layer are each conductive, and are conductively isolated from one another in said energy conditioner structure; wherein said first A layer includes a first A layer main body and a first A layer tab, said first B layer includes a first B layer main body and a first B layer tab, and said G layer includes a G layer main body and a G layer first tab; wherein said G layer is in a plane between a plane containing said first A layer and a plane containing said first B layer, where the main body of at least one of said first A layer and said first B layer opposes a portion of said G layer main body; wherein two of said first A layer tab, said first B layer tab, and said G layer first tab are on a first side of said energy conditioner, and the remaining one of said first A layer tab, said first B layer tab, and said G layer first tab is on a second side of said energy conditioner, and said second side is opposite from said first side; and said method comprising applying electrical energy to one of said first A layer, said G layer, and said first B layer.

1 CONTROL PAGE

2

3 INVENTOR:

4

5 David J. Anthony
6 3646 Fountain Way
7 Erie, PA 16506

8

9

10 ASSIGNEE: X2Y Attenuators, LLC.
11 2730B West 21st Street
12 Erie, PA 16506

13

14

15 TITLE: ENERGY CONDITIONER STRUCTURES

16

17 PRIORITY CLAIMS

18 This application claims priority to United States provisional application 60/779,455
19 filed 3/7/2006, attorney docket number X2YA0061P-US, entitled "ENERGY
20 CONDITIONER STRUCTURES".

1 TITLE: ENERGY CONDITIONER STRUCTURES

2
3 BACKGROUND OF THE INVENTION

4 CROSS REFERENCE TO RELATED APPLICATIONS

5 This application claims priority to United States provisional application 60/779,455
6 filed 3/7/2006, attorney docket number X2YA006IP-US, entitled "ENERGY
7 CONDITIONER STRUCTURES".

8 Field of the Invention

9 This invention relates to energy conditioning of electrical circuits.

10 SUMMARY OF THE INVENTION

11 It is an object of the invention to provide energy conditioning to electric circuits.

12 The invention provides energy conditioners, and methods of making and using them.

13 The energy conditioners each include at least one, each, of A, B, and G conductive
14 structures. Each A, B, and G conductive structure has one or more A, B, and G layers,
15 respectively. Each layer of the A and B structures have at least one tab. Each layer of the G
16 conductive structure has at least 2 tabs. These two tabs (of each layer of the G conductive
17 structure) are either on the same side of the energy conditioner as one another, or on opposite
18 sides of the energy conditioner as one another. If the two tabs of a layer of the G conductive
19 structure are on opposite sides of the energy conditioner as one another, then one of those two
20 tabs of the G layer is also on the same side of the energy conditioner as a tab of an A layer,
21 and the other of those two tabs of the G layer is on the same side as a tab of a B layer. If the
22 two tabs of a layer of the G conductive structure are on the same side of the energy
23 conditioner as one another, then a tab of an A layer and a tab of a B layer are both on the
24 opposite side of the energy conditioner as the two tabs of the G layer. In either embodiment,
25 the distance in the plane of the layers between the tab of the A layer and the tab of the B layer
26 does not exceed the distance between the two tabs of the G layer. Preferably, the main bodies
27 of the layers of the conductive structures are rectangular. Preferably, the A, B, and G tabs
28 extend from relatively longer sides of the main bodies of the layers of the conductive
29 structures.

30 Tab portions of each of the A, B, and G conductive structures are conductively

connected to the tab portions of the layers of the same conductive structure. The conductive connections result in all layers of the A conductive structure forming a single conductive structure, and likewise for the B and G conductive structures. In the discreet component embodiments, the peripheral ends of the tabs are contacted to a conductive material that forms part of the exterior surface of the energy conditioner. The inventors also conceive of integrated component embodiments. Integrated component embodiments include integrated circuit interposers, integrated circuit PC boards, and semiconductor integrated circuits. In the integrated embodiments, the A, B, and G layers are formed within a structure that extends further in the plane defined by the layers to other circuitry, including other contacts for other devices as in interposers and PC boards, and also including in integrated circuits active circuitry such as diodes and transistors. In the integrated embodiments, vias containing conductive material electrically interconnect the A layers to one another, the B layers to one another, and the G layers to one another. In addition, in the integrated embodiments, the A, B, and G conductive structures connect to conductive pathways of the integrated structure at locations of the tabs shown and described herein below for the discreet embodiments. That is, tabs of the discreet embodiments are replaced in the integrated embodiments by conductive pathways leading away from the stack of the main bodies of the A, B, and G electrodes. For convenience, herein below, reference to tabs in the disclosure and claims means either tabs as shown in the figures or conductive pathways of the integrated structure at locations of the tabs shown and described herein.

Several of the figures show layers labeled as either G, A, or B. G layers refer to one or more stacked layers that form part of a G conductive structure. A refers to one or more stacked layers that form part of an A conductive structure. B refers to one or more stacked layers that form part of a B conductive structure. Layers of each structure, A, B, or G, are aligned so that side edge surfaces of tabs of layers of that structure are aligned. This alignment allows conductive material along the side edge surfaces to contact the aligned side edge surfaces of layers of each conductive structure, A, B, or G, to thereby conductively connect only those layers of each structure to one another.

Several of the figures show a stack sequence of A, B, and G layers. The inventors conceive of repeating sets of these sequences in a stack within a single device. The inventors

1 also conceive of repeating sets of these sequences in a stack within a single device, in which
2 one, two, or more G conductive layers on each end of the stack sandwich the interior layers of
3 the stack. The inventors conceive of the conductive material conductively connecting to tabs
4 of one or more of the A, B, or G layer's tabs residing only on side surfaces of the discrete
5 embodiments, extending to top and bottom surfaces, or extending entirely around surfaces to
6 form a closed band.

7 In one aspect, the invention provides energy conditioner structures, method of making
8 and using them, wherein the structure comprises a sequence of conductive layers including a
9 first A layer, a G layer, and a first B layer; wherein said first A layer, said G layer, and said
10 first B layer are each conductive, and are conductively isolated from one another in said
11 energy conditioner structure; wherein said first A layer includes a first A layer main body and
12 a first A layer tab, said first B layer includes a first B layer main body and a first B layer tab,
13 and said G layer includes a G layer main body and a G layer first tab; wherein said G layer is
14 in a plane between a plane containing said first A layer and a plane containing said first B
15 layer; where the main body of at least one of said first A layer and said first B layer opposes a
16 portion of said G layer main body; wherein two of said first A layer tab, said first B layer tab,
17 and said G layer first tab are on a first side of said energy conditioner, and the remaining one
18 of said first A layer tab, said first B layer tab, and said G layer first tab is on a second side of
19 said energy conditioner, and said second side is opposite from said first side, and using the
20 structure comprises applying electrical energy to one of said first A layer, said G layer, and
21 said first B layer.

22 BRIEF DESCRIPTION OF THE DRAWINGS

23 Fig. 1A is a top plan view of a sub assembly 1;

24 Fig 1B is a top plan view of a sub assembly 20;

25 Fig. 2 is a top plan view of an assembly consisting of sub assemblies 1 and 20;

26 Fig. 3 is a top plan view in which sequential conductive layers of an assembly or
27 structure have been displaced vertically in the plane of the page from one another.

28 Figs. 3A, 4A, 4B, and 5 are also top plan views in which sequential conductive layers
29 of each assembly or structure have been displaced vertically in the plane of the page from one
30 another.

Fig. 6 is a perspective view of an exterior of an energy conditioner including any of the sequence of conductive layers shown in Figs. 3-5.

Figs. 7, 7A, 8, and 8A are also top plan views in which sequential conductive layers of each assembly or structure have been displaced vertically in the plane of the page from one another.

Fig. 9 is a perspective view of an exterior of an energy conditioner including any of the sequence of conductive layers shown in Figs. 7-8.

Figs. 10-15 are schematics of circuits including energy conditioners disclosed herein;

Figs. 16-19 are also top plan views in which sequential conductive layers of each assembly or structure have been displaced vertically in the plane of the page from one another.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Fig. 1A shows a sub assembly 1 consisting of conductive G layer 2 on dielectric layer 3. Dielectric layers are shown herein for convenience to illustrate that main bodies of adjacent conductive layers of A, B, and G structures are not in conductive contact with layers of a different conductive structure. There may however be conductive material in vias that selectively conductively connects A layers to A layers, B layers to B layers, and G layers to G layers.

Conductive G layer 2 consists of upper tab 4, lower tab 5, and main body 6. Conductive layer upper tab 4 extends from conductive layer upper side edge surface 7 of main body 6 to conductive layer upper tab upper side edge surface 10. Conductive layer lower tab 5 extends from conductive layer lower side edge surface 9 of main body 6 to conductive layer lower tab lower side edge surface 8. Conductive G layer 2 resides on dielectric layer 3. Dielectric layer 3 extends to and is delimited by dielectric layer upper side 12, dielectric layer lower side 13, dielectric layer left side 14, and dielectric layer right side 15. Upper tab 4's upper side edge surface 10 aligns with a portion of dielectric upper side edge surface 12. Lower tab 5's lower side edge surface aligns with a portion of dielectric layer lower side edge surface 13. Conductive layer upper side edge surface 7 is recessed from dielectric layer upper side edge surface 12. Conductive layer lower side edge surface 9 is recessed from dielectric layer side edge surface 13. Conductive layer left side edge surface 10 is recessed from

dielectric layer left side edge surface 14. Conductive layer right side edge surface 11 is recessed from dielectric layer right side edge surface 15. Upper tab 4 is near the left side of conductive G layer 2. Lower tab 5 is near the left side of conductive G layer 2.

In integrated embodiments, the dielectric layers extend further from the region of the main bodies of the layers of the integrated structures and the tabs need not terminate at a side edge of the dielectric layer. For example, a conductive lines extending from the locations of tabs for A, B, or G electrodes may terminate at the input of an active or passive circuit element inside the same integrated device.

Fig. 1B shows a sub assembly 20 consisting of conductive layer 21 residing on dielectric layer 22. Conductive layer 21 represents either an A layer or a B layer. Conductive layer 21 includes main body 23 and tab 24. Conductive layer main body 23 includes upper, left, and right side edge surfaces (unnumbered), and lower side edge surface 9A, that are recessed compared to upper, lower, left, and right sides of dielectric layer 22. Tab 24 extends from the lower left side of conductive layer main body 23 to tab side edge surface 25. Conductive layer 21 has only one tab.

The dielectric layers of Figs. 1A and 1B are of the same size and shape such that, when stacked, the side edge surfaces of the dielectric layers are aligned.

Fig. 2 is an assembly of sub assemblies 1 and 20 showing alignment of side edge surfaces of the dielectric layers, and overlap of the main bodies of the conductive layers of G and A or B. Main body 23 of the A or B conductive layer is recessed compared to larger main body 6 of the G layer. See side edge surfaces 9, 9A; the horizontal distance in the plane of the paper between them defining the length of a recess. The surface area of the major surfaces of the main bodies of any one of the A and B layers is less than the surface area of the major surfaces of the main body of the G layer. Note that conductive layer main body 23's upper, lower, left, and right sides surfaces (not numbered) are recessed compared to upper 7, lower 9, left 10, and right 11 side edge surfaces of G layer 2, respectively. Note that tab 24 is the only portion of the A or B layer that extends beyond at least one side edge surface of the G layer, in this case side edge surface 9 of G layer 6.

In less preferred embodiments, the G main body is the same size as, or smaller than, the A or B main body.

Fig. 2 also shows that the tab of the A or B layer does not overlap the tabs of the G layer, and that the tab of the A or B layer extends beyond the side edge surfaces of the G layer. Fig. 2's tab and edge alignments, tabs of different A, B, or G only overlapping with layers of the same conductive structure, and main bodies of A or B layers recessed compared to main bodies of G layers, are representative of alignments of the stacks of conductive layers of energy conditioners described herein below, unless expressly specified otherwise.

Fig. 3 shows a stack of conductive layers in the sequence A, G, B of an energy conditioner embodiment 300. In embodiment 300, the G conductive layer tabs are on the upper left and lower right sides of the G conductive layer's main body. The A and B conductive layers have conductive tabs on the upper right side and lower left side of the A and B main bodies, respectively. The main bodies of the A, B, and G conductive layers are relatively extended in the left to right direction. As a result no tab of the A conductive structure overlaps with a tab of the B or G conductive structure, and no tab of the B conductive structure overlaps a tab of the G conductive structure. No tabs extend from the left or right sides. In the stack, the A and B conductive layers' main bodies are recessed compared to the G conductive layer's main body.

In alternative and less preferred embodiments, the main bodies of the A, B, and G conductive layers are relatively extended in the top to bottom of the page direction such that the tabs of the conductive layers are all on relatively short sides of the energy conditioner.

Fig. 3A shows a stack of conductive layers in the sequence, from top to bottom of the stack, of A, G, B, G, of energy conditioner embodiment 300A. Embodiment 300A has the same stack of layers A, G, B as embodiment 300, and an additional G layer below the B layer. Both G layers have the same size, shape, and orientation in the stack. Embodiment 300A is representative of the fact that additional layers in energy conditioner embodiments, in the sequence A, G, B, G, A, G, B, etcetera, are conceived by the inventors. In addition, the inventors conceive of replacing one or more or all of the G layers, with 2, 3, or more G layers.

Fig. 4A shows a stack of conductive layers, having an A layer and a B layer in the same plane, for an energy conditioner embodiment 400A. The tab of the A layer in one plane is aligned with tabs of the A layers in the other planes. The tabs of the B layer in one plane is aligned with the tabs of the B layers in the other planes. Each plane containing A and B

1 layers is separated by a G layer. The main body of each A layer overlaps the main bodies of
2 the other A layers in the stack. The main body of each B layer overlaps the main bodies of
3 the other B layers in the stack. No main body of any A layer overlaps the main body of any B
4 layer in the stack. Novel features of this energy conditioner are the combination of the
5 arrangement of the tabs, having two tabs on one side, and two tabs on the opposite side, A
6 and B layers in the same plane, and overlap of A main bodies with only other A main bodies.

7 Fig. 4B shows conductive layers of energy conditioner embodiment 400B.
8 Embodiment 400B includes the same layers as embodiment 400A and also a second G
9 conductive layer at the bottom of the stack. Fig. 4B illustrates that, like Fig. 3A, additional
10 layers following the sequence A, G, B, G, A, G, B, etcetera, are contemplated by the
11 inventors.

12 Fig. 5 shows a stack of conductive layers in the sequence G, A, G, B, G of an energy
13 conditioner embodiment 500. Embodiment 500 has the same stack of layers A, G, B as
14 embodiment 300, and the same stack A, G, B, G as embodiment 300A. It however shows a
15 preferred feature, which is the existence of G layers at the top and the bottom of the stack.

16 Alternatively, two or more G layers may reside at the top and the bottom of the stack.

17 A novel feature of the energy conditioner embodiments of Figs. 3, 3A, 4A, 4B, and 5
18 is the arrangement of the two G tabs, the A tab, and the B tab such that two of those tabs are
19 on one side of the energy conditioner, the other two tabs are on the other side of the energy
20 conditioner, and the distance between the A tab and the B tab is less than or equal to the
21 distance between the two G tabs.

22 Fig. 6 shows an exterior arrangement 600 of conductive contacts to the A, B, and G
23 structures of any of the foregoing discreet energy conditioner embodiments. In all of these
24 embodiments, the G conductive structure has tabs leading to conductive contacts at the upper
25 left and lower right sides of the stacks, corresponding to the G conductive contacts on the
26 upper left and lower right sides of the exterior arrangement 600, and the energy conditioner is
27 longer in the left to right direction in the page than in the top to bottom direction in the page.
28 Likewise, the tabs of the A and B layers of the foregoing discreet energy conditioner
29 embodiments result in an A conductive contact on the exterior upper right and a B conductive
30 contact on the exterior lower left side as shown in the plane of the paper of Fig. 6. The

1 conductive contacts are preferably formed from material applied to the exposed edges of the
2 tabs and which material forms conductive material upon firing at sufficient temperature, as is
3 well known in the art.

4 Marker 601 represents a visual marker indicating arrangement of contacts of exterior
5 arrangement 600. Marker 601 allows a user knowledge of which contacts are A, B, and G
6 contacts. As shown, marker 601 is between B and G contacts, indicating that the upper right
7 side contact is an A contact. Dielectric surfaces D form portions of the exterior surface of
8 exterior arrangement 600.

9 Figs. 7, 7A, 8, 8A, 16, and 17 illustrate conductive layers of energy conditioners
10 having tab arrangements wherein both tabs of the layers of the G conductive structure extend
11 from one side of the stack of conductive layers, and tabs of layers of the A and B conductive
12 structures extend from a side of the stack opposite the side having the tabs of the G layers.

13 Fig. 9 shows an exterior arrangement 900 of conductive contacts to the A, B, and G
14 structures for embodiments in which both G conductive structures are on the same side of the
15 energy conditioner. Such as the embodiments shown in Figs. 7, 7A, 8, 8A, 16, and 17. In this
16 arrangement, marker 601 indicates which conductive contacts are A, B, or G. For example,
17 with an indicia "B" and an arrow pointing toward the adjacent B contact. With respect to
18 Figs. 16 and 17, G and G' marker 601 may indicate by its position or indicia which is G and
19 which is G'.

20 Figs. 16-19 illustrate conductive layers of energy conditioners in which the single G
21 layer of prior embodiments is replaced by a pair of coplanar G layers, referred to as the G and
22 G' layers. These embodiments may include four separate conductive structures, one each
23 associated with the A, B, G, and G' layer or layers. Alternatively, conductive structure
24 exterior to the main bodies of the G, G', A, and B conductive layers may conductively
25 connect the G and G' layers to one another, such as an exterior band in discrete embodiments.

26 Figs. 16 and 18 also illustrate embodiments in which there is a single A or B layer in
27 each plane. Figs. 17 and 19 illustrate embodiments in which there are coplanar A and B
28 layers. Figs. 16 and 17 illustrate embodiments in which the G and G' tabs are on one side of
29 the energy conditioner, and the tabs for A and B electrodes are on the opposite side of the
30 energy conditioner. Figs. 19 and 20 illustrate embodiments in which the G or G' tabs are on

the same side as the A tab, and the other of the G and G' tabs are on the same side as the B tabs, and the G and G' tabs are on opposite sides of the energy conditioner from one another.

Figs. 10-15 show circuit diagrams for circuits including any of the foregoing energy conditioners. In Figs. 10-15, G1 and G2 represent the two conductive contacts, to the two G conductive structures or to the G and G' conductive structures. A and B represent conductive contact to the A and B conductive structures. Source, S, S1, and S2 represent sources of electric energy. R represents a return from a load to a source. Load, L, L1, and L2 represent electric power loads. P represents a system ground. Arrows indicate conductive path directions away from higher voltage terminals of sources of power. Circuits 1-6 refer respectively to the circuits and elements shown in Figs. 10-15 respectively.

In implementation, an energy conditioner embodiment disclosed herein is incorporated into one of circuits 1-6 shown in Figs. 10-15, and power is applied from the source or sources to the load or loads. The energy conditioner substantially limits transmission of power in frequencies above DC in and from the circuit.

Preferably, the set back ratio of an A layer is greater than 0.5, preferably greater than 1, and more preferably greater than 5. The set back distance is defined as the distance in the plane of the layers that an edge surface of the A layer is recessed compared to the edge surface of an adjacent G layer (for example the distance between edge surfaces 9 and 9A; see Figs 1, 1A, and 2), divided by the minimum distance between surfaces of the adjacent A and G layers.

A preferred stacking configuration found within a single device has an even integer number of the sum of the A and B conductive layers and an odd integer number of a sum of the G conductive layer(s).

A preferred stacking configuration found within a single device has an even integer number of the sum of the A and B conductive layers and an even integer number of a sum of the G conductive layer(s).

A preferred stacking configuration found within a single device has a total sum number of all conductive layers in a stacking being an odd integer number.

A preferred stacking configuration found within a single device has a G conductive layer found to be the common center electrode layer of the entire stacking within a single

1 device. This stacking has the sum of the A, B, and G layers found on each side of the center G
2 conductive layer being an even integer number.

3 A preferred stacking configuration found within a single device has an odd integer
4 number of A and B conductive layers and/or an even integer number of G conductive layers.

5 An alternate stacking configuration found within a single device has a G conductive
6 layer found to be the common center electrode layer of the entire stacking within a single
7 device. This stacking has the sum of the A, B, and G layers found on one side of the center G
8 conductive layer having one additional A, B, or G layer than the other the sum of the A, B,
9 and G layers found on the opposite side of the center G conductive layer.

10 A preferred stacking configuration of a single device has a rectangular shape having
11 all outer side edges of A, B, and G conductive layer tabs found at a pair of long, opposing
12 sides (relative to a pair of short, opposing sides of such a rectangular shaped device) of such a
13 rectangular shaped device.

14 It should be noted that marker 601 represents any type of marker indicating
15 arrangement of contacts of exterior arrangement 600. Such markers include markers that may
16 be visible under spectrum readers that read marks outside the range of human visibility, such
17 as infrared readers and such.

1 CLAIMS

- 2
- 3 1. An energy conditioner structure comprising:
- 4 a sequence of conductive layers including a first A layer, a G layer, and a first B layer;
- 5 wherein said first A layer, said G layer, and said first B layer are each conductive, and
- 6 are conductively isolated from one another in said energy conditioner structure;
- 7 wherein said first A layer includes a first A layer main body and a first A layer tab,
- 8 said first B layer includes a first B layer main body and a first B layer tab, and said G layer
- 9 includes a G layer main body and a G layer first tab;
- 10 wherein said G layer is in a plane between a plane containing said first A layer and a
- 11 plane containing said first B layer;
- 12 where the main body of at least one of said first A layer and said first B layer opposes
- 13 a portion of said G layer main body;
- 14 wherein two of said first A layer tab, said first B layer tab, and said G layer first tab
- 15 are on a first side of said energy conditioner, and the remaining one of said first A layer tab,
- 16 said first B layer tab, and said G layer first tab is on a second side of said energy conditioner,
- 17 and said second side is opposite from said first side;
- 18 wherein said energy conditioner structure comprises a fourth tab, and said fourth tab is
- 19 either part of said G layer or said fourth tab is conductively isolated in said energy conditioner
- 20 structure from said first A layer, said G layer, and said first B layer; and
- 21 wherein a distance between said first A layer tab and said first B layer tab is less than
- 22 or equal to a distance between said G layer first tab and said fourth tab.
- 23 2. The structure of claim 1 wherein the main bodies of both of said first A layer and said
- 24 first B layer oppose portions of said main body of said G layer, and said G layer further
- 25 comprises a G layer second tab, which is said fourth tab.
- 26 3. The structure of claim 2 wherein two of said first A layer tab, said first B layer tab,
- 27 said G layer first tab, and said G layer second tab are on a first side of said energy
- 28 conditioner, and the other two of said first A layer tab, said first B layer tab, said G layer first
- 29 tab, and said G layer second tab are on a second side of said energy conditioner, and said
- 30 second side is opposite from said first side.

1 4. The structure of claim 3 wherein said G layer first tab and said G layer second tab are
2 both on said first side.

3 5. The structure of claim 3 wherein said G layer first tab is on said first side and said G
4 layer second tab is on said second side.

5 6. The structure of claim 1 wherein said first A layer main body overlaps said first B
6 layer main body.

7 7. The structure of claim 1 further comprising a second A layer having a second A layer
8 main body and a second A layer tab, and a second B layer having a second B layer main body
9 and a second B layer tab;

10 wherein said first A layer and said second B layer are in the same plane as one
11 another;

12 wherein said first B layer and said second A layer are in the same plane as one
13 another;

14 wherein said first A layer and said second A layer do not overlap with said first B
15 layer or said second B layer;

16 wherein said first A layer tab and said second A layer tab are aligned with one
17 another;

18 wherein said first B layer tab and said second B layer tab are aligned with one another.

19 8. The structure of claim 1 further comprising:

20 a G' layer;

21 wherein said G' layer is conductive and is conductively isolated in said energy
22 conditioner from said first A layer, said first B layer, and said G layer;

23 wherein said G' layer comprises a G' main body portion and a G' tab portion, and said
24 G' tab portion is said fourth tab;

25 wherein said G' layer is in the same plane as said G layer;

26 wherein said first A layer main body opposes a portion of said G layer main body;

27 wherein second first B layer main body opposes a portion of said G' layer main body.

28 9. The structure of claim 8 wherein two of said A layer tab, said B layer tab, and said G
29 layer tab, and said G' layer tab are on a first side of said energy conditioner, and the
30 remaining two are on a second side of energy conditioner, and said second side is opposite

1 from said first side.

2 10. The structure of claim 9 wherein said G layer tab and said G' layer tab are on said first
3 side of said energy conditioner and said A layer tab and said B layer tab are on said second
4 side of said energy conditioner.

5 11. The structure of claim 9 wherein said G layer tab, and said A layer tab are on said first
6 side of said energy conditioner and said G' layer tab and said B layer tab are on said second
7 side of said energy conditioner.

8 12. The structure of claim 8 further comprising a second A layer comprising a second A
9 layer main body and a second A layer tab, and a second B layer comprising a second B layer
10 main body and a second B layer tab;

11 wherein said first A layer and said second B layer are in the same plane as one
12 another;

13 wherein said first B layer and said second A layer are in the same plane as one
14 another;

15 wherein said first A layer and said second A layer do not overlap with said first B
16 layer or said second B layer;

17 wherein said first A layer tab and said second A layer tab are aligned with one
18 another;

19 wherein said first B layer tab and said second B layer tab are aligned with one another.

20 13. The structure of claim 1 further comprising a second G layer below said first B layer.

21 14. The structure of claim 13 further comprising a third G layer above said first A layer.

22 15. A discrete energy conditioner comprising the structure of claim 1.

23 16. An integrated energy conditioner comprising the structure of claim 1.

24 17. The conditioner of claim 16 further comprising vias containing conductive material
25 connecting G layers to one another.

26 18. A circuit comprising an energy conditioner incorporating the structure of claim,
27 wherein said circuit is configured in one of the circuit 1 to circuit 6 configurations.

28 19. A method of making an energy conditioner structure comprising:

29 providing a sequence of conductive layers including a first A layer, a G layer, and a
30 first B layer;

1 wherein said first A layer, said G layer, and said first B layer are each conductive, and
2 are conductively isolated from one another in said energy conditioner structure;

3 wherein said first A layer includes a first A layer main body and a first A layer tab,
4 said first B layer includes a first B layer main body and a first B layer tab, and said G layer
5 includes a G layer main body and a G layer first tab;

6 wherein said G layer is in a plane between a plane containing said first A layer and a
7 plane containing said first B layer;

8 where the main body of at least one of said first A layer and said first B layer opposes
9 a portion of said G layer main body;

10 wherein two of said first A layer tab, said first B layer tab, and said G layer first tab
11 are on a first side of said energy conditioner, and the remaining one of said first A layer tab,
12 said first B layer tab, and said G layer first tab is on a second side of said energy conditioner,
13 and said second side is opposite from said first side.

14 20. A method of using an energy conditioner structure, said structure comprising:

15 a sequence of conductive layers including a first A layer, a G layer, and a first B layer;
16 wherein said first A layer, said G layer, and said first B layer are each conductive, and
17 are conductively isolated from one another in said energy conditioner structure;

18 wherein said first A layer includes a first A layer main body and a first A layer tab,
19 said first B layer includes a first B layer main body and a first B layer tab, and said G layer
20 includes a G layer main body and a G layer first tab;

21 wherein said G layer is in a plane between a plane containing said first A layer and a
22 plane containing said first B layer;

23 where the main body of at least one of said first A layer and said first B layer opposes
24 a portion of said G layer main body;

25 wherein two of said first A layer tab, said first B layer tab, and said G layer first tab
26 are on a first side of said energy conditioner, and the remaining one of said first A layer tab,
27 said first B layer tab, and said G layer first tab is on a second side of said energy conditioner,
28 and said second side is opposite from said first side;

29 said method comprising applying electrical energy to one of said first A layer, said G
30 layer, and said first B layer.

- 1 21. The structure of claim 1, wherein each of said first A layer, of said first B layer and of
2 said G layer have at least one major surface;
3 wherein any one of said at least one major surface has a surface area; and wherein said
4 surface area of said at least one major surface of said G layer is larger than said surface area
5 of either said at least one major surface of said first A layer or of said at least one major
6 surface of said first B layer.
- 7 22. The structure of claim 3, wherein each of said first A layer main body, of said first B
8 layer main body and of said G layer main body have at least one major surface;
9 wherein any one of said at least one major surface has a surface area; and
10 wherein said surface area of said at least one major surface of said G layer main body
11 is larger than said surface area of either said at least one major surface of said first A layer
12 main body or of said at least one major surface of said first B layer main body.
- 13 23. The structure of claim 1, wherein said first A layer and said first B layer sandwich
14 said G layer.
- 15 24. The structure of claim 3, wherein said first A layer main body and said first B layer
16 main body sandwich said G layer main body.
- 17 25. The structure of claim 23, wherein said G layer is larger than either said first A layer
18 or said first B layer.
- 19 26. The structure of claim 24, wherein said G layer is larger than either said first A layer
20 or said first B layer.
- 21 27. The structure of claim 1, wherein said G layer is larger than said first A layer.
- 22 28. The structure of claim 3, wherein said G layer is larger than said first B layer.
- 23 29. The structure of claim 23, wherein said G layer is larger than said first A layer.
- 24 30. The structure of claim 24, wherein said G layer is larger than said first B layer.
- 25 31. The structure of claim 29, wherein said first A layer is substantially the same in size as
26 said first B layer.
- 27 32. The structure of claim 30, wherein said first A layer is substantially the same in size as
28 said first B layer.
- 29 33. The structure of claim 21, wherein said first A layer is substantially the same in size as
30 said first B layer.

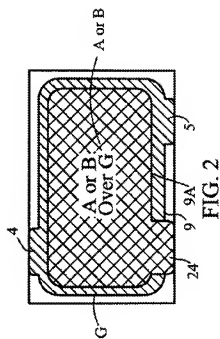
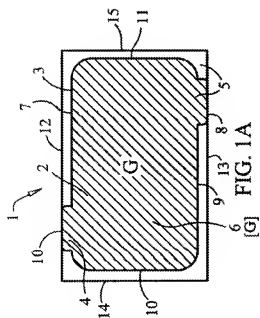
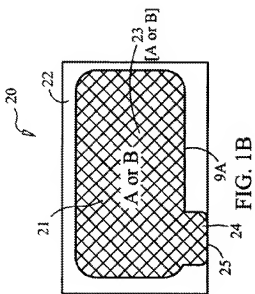
1 34. The structure of claim 22, wherein said first A layer main body is substantially the
2 same in size as said first B layer main body.

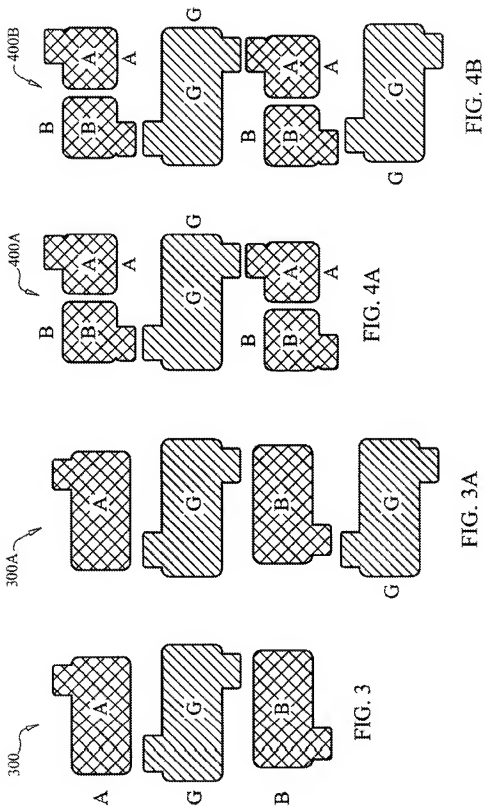
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23 ran/BTM

24 Date/time code: March 6, 2007 (6:09pm)

25 Y:\Clients\X2YA\X2YA0063\X2YA0063U-PCT\Drafts\SpecificationWithAddedClaims_X2

26 YA0063U-PCT_3-6-2007.wpd
27
28
29
30





5/6

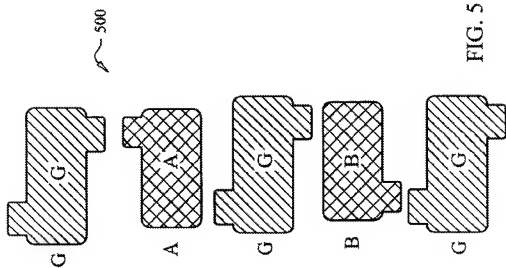


FIG. 5

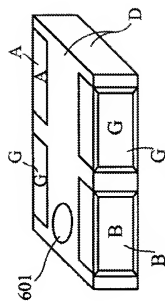
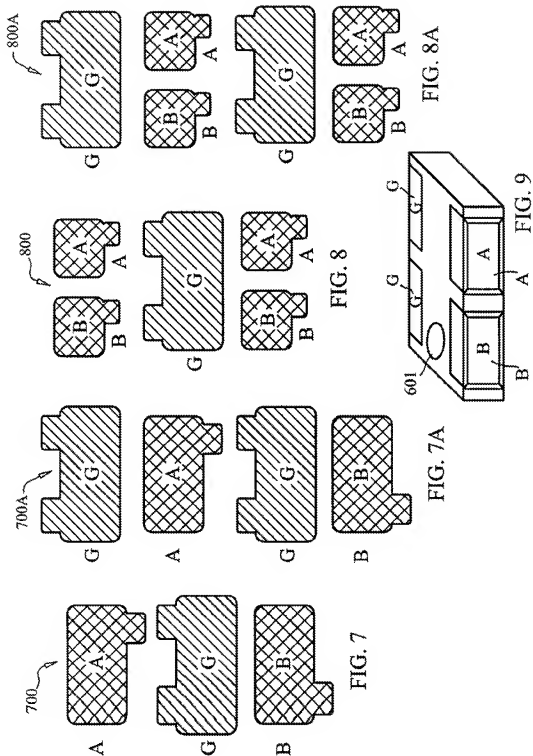


FIG. 6



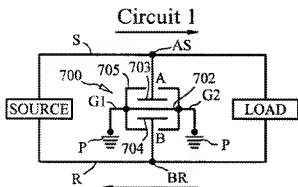


FIG. 10

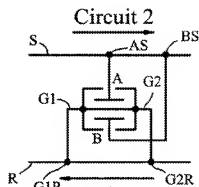


FIG. 11

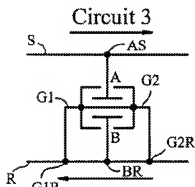


FIG. 12

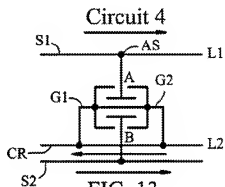


FIG. 13

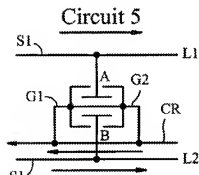


FIG. 14

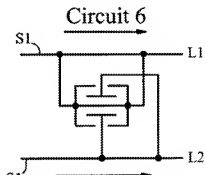


FIG. 15

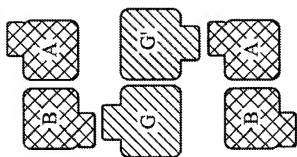


FIG. 19

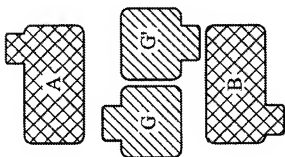


FIG. 18

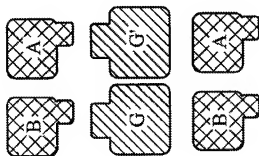


FIG. 17

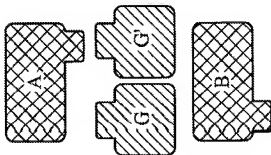


FIG. 16

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2007/063463**A. CLASSIFICATION OF SUBJECT MATTER***H01G 4/35(2006.01)i*

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 8: H01G 4/35, H02H 9/00, H01L 23/552

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean Utility models and applications for Utility Models since 1975

Japanese Utility models and applications for Utility Models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKIPASS(KIPO internal) "energy", "conditioner", "conductive", "layer"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2005-065097 A3 (X2Y ATTENUATORS, LLC) 21 July 2005 See the abstract; figure 1A	1-17, 19-34
A	US 2002-0044491 A1 (ANTHONY, ANTHONY A. et al.) 18 April 2002 See the abstract; figure 1	1-17, 19-34
A	US 6563688 B2 (ANTHONY, ANTHONY A. et al.) 13 May 2003 See the abstract; figures 1, 2	1-17, 19-34
A	US 2002-0027263 A1 (ANTHONY, ANTHONY A. et al.) 07 March 2002 See the abstract; figures 1, 2	1-17, 19-34



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application text cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"Z" document member of the same patent family

Date of the actual completion of the international search

24 JULY 2007 (24.07.2007)

Date of mailing of the international search report

24 JULY 2007 (24.07.2007)

Name and mailing address of the ISA, KR



Korean Intellectual Property Office
920 Daesang-dong, Seo-gu, Daejeon 302-701,
Republic of Korea

Facsimile No. 82-42-372-7190

Authorized officer

HAN, SANG IL

Telephone No. 82-42-481-8185



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2007/063463

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 18
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
in the claim 18, the number of claim described is not specified, and the configurations of the circuit 1 to circuit 6 are not described at all.
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This international Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims: it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2007/063463

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
W02005065097A3	21.07.2005	CN1890854A EP01630033A2 KR1020060120683 KR2006120685A US20080236411A1 US20070109709A1 US2007109709A W02005065097A2 W02005065097A3	03.01.2007 06.03.2006 27.11.2006 27.11.2006 19.10.2008 17.06.2007 17.06.2007 21.07.2005 21.07.2005
US20020044401A1	18.04.2002	None	
US08563638B2	13.05.2003	None	
US20020027263A1	07.03.2002	None	